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ALL

GAGES AND GAGE TESTING*

Reserve

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GEARLESS GAGES

When I first started the gage testing program at this experiment station I attempted to adjust gearless-type gages. Sometimes I successfully set them for the correct values, but more often I made the error worse. Consequently I gave up trying to adjust the gearless gages, relying upon the accompanying statement that showed the correct pressures for the respective gage readings. I felt that the results obtained by trying to adjust the gearless gages did not warrant the time I had to spend trying to make the adjustment. Usually with the gearless-type gage when the calibration was in error by more than 2 psi, I suggested that a new gage be purchased.

NEW GAGES

I believe that it is advantageous to check all new gages before a canner is used. This does not apply to the weight-type gage because there is nothing inherent to cause them to change calibration. Since the manufacturers claim that their gages should be correct to within plus or minus 0.5 psi, I believe one would not be unjustified in returning a gage that is in error by more than this amount. However, in practice it should not be necessary to return the gage if the error is 1 psi or less.

EDUCATIONAL PROGRAM

Inspection: Before the pressure canner or pressure saucepan is used, the lid should be inspected to see that all openings are free to permit the passage of steam where necessary. This means that the safety valve should be dismantled and the hole in the stem inspected. The safety valve should then be properly assembled and be adjusted to blow off at from 23 to 25 psi. It should be noted that the opening in the stem of the gage is clean, that the hand on the Bourdon gage moves freely, and that the gage has been tested for accuracy. The safety plug should be inspected to see that it is in working condition. The locking device should be inspected for any breaks, fractures, stripped bolts or nuts, and poor gaskets, where used. Some of these inspection items need be made only occasionally; however, I would suggest that the safety valve and pressure gage be inspected each time the pressure cooker is used.

*Notes from discussion on "Pressure Gages, Testing and Adjusting; Standards for Gages" presented at the Home Canning Research Conference held in Kansas City, Missouri, December 5, 6, and 7, 1946

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Maintenance: whenever faulty parts are discovered, they should be replaced immediately. The safety valve should be cleaned and kept polished each time the canner is used. The pressure gage should be tested at least once a year and preferably twice a year. These items are the ones I would emphasize and might be in addition to the ones which are customarily given.

GAGE TESTING RECORDS

In order to secure data regarding faulty gages, each State should record the following: The correct pressure for gage readings of 5, 10, and 15 and the gage reading for zero pressure. The type of gage, whether gear or gearless, and an estimated age of the gage. Although we may not wish to use trade names, I believe it would be a help if during a year's testing the name of the gage or the cooker upon which it is used would be recorded. Thus, if necessary, we could point out to respective manufacturers how well their gages are retaining their calibration. Readings for pressure should be recorded to at least within 0.5 psi and if possible to within 0.1 psi. Of course, the fraction is an estimate, but with the ordinary type of test-gages being used, I believe the testing agent can estimate to within plus or minus 0.1 psi.

THERMOMETERS

When I raised objections to the use of a thermometer on the pressure cookers, I had particularly in mind the mercury in glass thermometers. I have used such a thermometer and it worked satisfactorily; however, we have broken two of them in the laboratory, mainly by letting the pressure cooker boil dry and thus causing the mercury to break out through the top of the glass stem. Also it is a fallacy to say that mercury thermometers will always indicate correctly unless calibrated. Sometimes I have had considerable difficulty in rejoining a mercury column. I am not opposed to the use of a thermometer on a cooker if one can be designed which will retain its calibration and will not be subject to breakage. However, I certainly would not use one at the laboratory constantly without checking it against another thermometer at frequent intervals.

I believe the advantages of having a thermometer on the pressure canner would be as follows:

It would serve as a check on the temperature indicated by the pressure gage. Here again when I say "temperature as indicated by the pressure gage" I am assuming that the pressure canner has been properly vented so that no air is contained within it, and under these conditions the pressure gage can be used as a temperature indicator. When the canner is equipped with both a thermometer and a pressure gage, should there be a discrepancy in the readings of either of them, they should be checked to see which instrument is in error. This would eliminate the uncertainty of knowing when the pressure gage should be checked.

Of course, we have always pointed out that at altitudes above 2,000 feet a correction on the gage is necessary; for that reason, I would suggest that pressure be thought of in terms of total pressure, rather than in gage pressure. For instance, to have water boil at 212° the vapor pressure will

be 14.7 psi. When the vapor pressure is 19.7 psi, water will boil at approximately 227.5°F., and likewise for vapor pressures of 24.7 psi and 29.7 psi, the boiling point of water will be approximately 240° and 250° F., respectively. Now 14.7 psi is standard atmospheric pressure at sea level, and roughly for each increase in elevation of 2,000 feet the barometric pressure decreases by 1 psi. Thus you can see that at an elevation of 5,000 feet the barometric pressure will be somewhere around 12.2 psi; so, in order to have water boil at a temperature of 250°, the gage pressure reading must be 29.7 psi minus 12.2 psi, which is 17.5 psi. Hence, we say that at this altitude we must add 2.5 psi to the gage reading to get the correct processing temperature. These are the conditions that must be met, plus complete exhaustion of air from the pressure cooker to have the pressure gage indicate temperature correctly.

You might be interested to know that I have submitted a project to the station council on the causes of liquid loss from glass jars processed in the pressure canner. I have not heard whether the project has been approved because I doubt that the station council has met this month. If it is approved, I hope that work can be started very soon.

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